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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,050	03/31/2004	Ian A. Young	42P19119	5714

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EXAMINER

SAYADIAN, HRAYR

ART UNIT PAPER NUMBER

2828

DATE MAILED: 07/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/814,050	Applicant(s) YOUNG ET AL.	
	Examiner Hrayr A. Sayadian	Art Unit 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 3,5,6 and 18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,7-17 and 19-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 3/13/04, 6/15/04, & 7/25/05
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election Requirement

1. This application and originally pending claims 1-30 are directed to the following patentably distinct species:

A. The VECSEL described with respect to FIG. 2A, wherein the mutually exclusive characteristic comprises the absorber being immediately next to the lower mirror.

B. The VECSEL described with respect to FIG. 3, wherein the mutually exclusive characteristic comprises the absorber being immediately next to the pump laser but away from the output coupler.

C. The VECSEL described with respect to FIG. 4, wherein the mutually exclusive characteristic comprises the absorber being immediately next to the pump laser, and wherein the pump energy is through the lower mirror.

D. The VECSEL described with respect to FIG. 5, wherein the mutually exclusive characteristic comprises the absorber being between the gain medium and the output coupler, and wherein the laser is electrically pumped.

E. The VECSEL described with respect to FIG. 6, wherein the mutually exclusive characteristic comprises the absorber being immediately next to the lower mirror and being between the gain medium and the lower mirror, and wherein the laser is electrically pumped.

F. The VCSEL described with respect to FIG. 7, wherein the mutually exclusive characteristic comprises the absorber being immediately next to the gain medium and being between the gain medium and the output coupler microlens, the VCSEL including an index-matching layer.

G. The VCSEL described with respect to FIG. 8, wherein the mutually exclusive characteristic comprises the absorber being immediately next to the gain medium and being between the gain medium and the output coupler microlens, the VCSEL not including an index matching layer.

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H. The Solid State Laser described with respect to FIG. 12, wherein the mutually exclusive characteristic comprises having a quantum dot semiconductor saturable absorber (SESAM) not integrated into the laser medium.

I. The Solid State Laser described with respect to FIG. 13, wherein the mutually exclusive characteristic comprises having a quantum dot semiconductor saturable absorber (SESAM) integrated into the solid state laser medium.

Additionally, Species A-G each includes two sub-Species:

1. An embodiment wherein the absorber is formed from quantum dots (see, for example, [0051]-[0054]).

2. An embodiment wherein the absorber is formed from quantum wells (see, for example, [0055]-[0057]).

2. In the Office Action mailed on 4/6/2006, Applicants were required under 35 U.S.C. 121 to elect a single disclosed species from the ones described above, even if this requirement was traversed. Applicants were advised that a reply to this requirement must:

1. identify and elect a Species consonant with this requirement, and
2. list all claims reading on the elected Species, including any claims subsequently added.

Applicants were reminded that an argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Applicants were required to indicate which claim(s) added after the election, if any, read upon the elected species. M.P.E.P. § 809.02(a).

Applicants were reminded that, upon the allowance of a generic claim, pending claims to additional species depending from, or otherwise requiring all the limitations of, an allowable generic claim will be considered. See, 37 C.F.R. § 1.141.

Applicants were reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application.

And Applicants were reminded that any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

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3. In a reply, USPTO stamped 4/27/2006, Applicants cancelled claims 28-30, and elected Species G2, with traverse. The filed response identifies claims 1-4, 7-17, and 19-27 as reading on the elected Species.

Applicants' response argues that claims 1 and 25 are linking claims. The filed response also argues that Species G8 can be implemented in any of the embodiments disclosed in FIGs. 9A, 9B, 10, and 11.

In Response, Examiner notes that claims 1 and 25 are generic claims, wherein claim 1 is broader than claim 25. Indeed, the Election Requirement DOES NOT restrict the pending computer system claims from the other apparatus claims. Pending claims 25-27 will therefore be examined.

Examiner also notes that the Election Requirement DOES NOT call for restricting out embodiments directed to FIGs. 9A, 9B, 10 and 11. Accordingly, Applicants argument directed to the issue of these FIGs. is moot.

Examiner notes however that claim 3 is directed to a non-elected Species (Species directed to a VECSEL, as opposed to the elected VCSEL Species G). Claim 3 therefore will be withdrawn from consideration by the examiner as being drawn to a non-elected invention. See, 37 C.F.R. § 1.142(b).

In summary therefore claims 3, 5, 6, and 18 are withdrawn from consideration, and claims 1, 2, 4, 7-17, and 19-27 are the subject of this Office Action.

The Election Requirement is maintained and is now made final.

Claim Rejections - 35 U.S.C. § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102, the bases for the anticipation rejections set forth in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 2, 4, 7, and 10 are rejected under 35 U.S.C. § 102(b) as being anticipated by WO 200159895, published 8/16/2001 (corresponding to EPO 1264373, published 12/11/2002, and corresponding to U.S. Pat. No. 6,735,234 to Paschotta et al., hereinafter "Paschotta"); element number and column and line reference will be with respect to the US patent).

With respect to Claim 1:

Paschotta discloses all of the recited features.

Specifically, Paschotta discloses: An apparatus, comprising: a lower mirror (for example, either of FIGs. 8 or 9, element 6; see paragraph starting column 8, line 52) and an output coupler (for example, either of FIGs. 8 or 9, element 12) defining a laser cavity; a gain region (for example, either of FIGs. 8 or 9, element 3) in a monolithic gain structure (element 3 is MQW; it and the neighboring layers are grown over the substrate 68) positioned in the laser cavity; and an absorber integrated with the gain region in the monolithic gain structure (see, for example, either of FIGs. 8 or 9, element 5), wherein a saturation fluence of the absorber is less than a saturation fluence of the gain region (see, for example, the paragraph starting column 4 line 21).

With respect to Claim 2:

Paschotta discloses the apparatus being a vertical cavity surface emitting laser.

With respect to Claim 4:

Paschotta discloses the absorber being aligned with a peak field intensity of a standing wave pattern generated during excitation of the gain region. See, for example, FIG. 10, maximum intensity on element 51.

With respect to Claim 7:

Paschotta discloses the absorber comprises a first quantum well layer (see, for example, the paragraph starting column 7, line 36) and the gain region comprises a second quantum well layer (see, for example, the paragraph starting column 6, line 18, describing the element 3 as being an MQW).

With respect to Claim 10:

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Paschotta discloses the monolithic gain structure comprising the lower mirror. (See, for example, paragraph starting column 8, line 52, describing the "active-absorber-mirror element" 6).

Claim Rejections - 35 U.S.C. § 103

6. The following is a quotation of 35 U.S.C. § 103(a), the basis for the obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section § 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 8 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of "Picosecond SESAM-BASED Ytterbium Mode-Locked Fiber Laser," by Gomes et al., IEEE Journal of Selected Topics in QE, V10, NO.1, pp 129-136 (2004) [hereinafter "Gomes"], and 1.5 micron Monolithic GaInNAs Semiconductor Saturable-Absorber ... , by Okhotnikov et al., Optics Letters, Vol. 28, No. 5, pp 364-366 (2003) [hereinafter "Okhotnikov"].

Paschotta discloses the second QW comprising InGaAs layer (see, for example, column 7, lines 13-19). Paschotta however fails to disclose the first QW comprising GaInNAs.

Gomes however discloses using SESAMs that comprise a GaInNAs QW well layer (See, for example, p.130, left column, starting with the fifth sentence in the second full paragraph, referring to the SESAM being grown similar to the SESAM described by Okhotnikov). Gomes also motivates using GaInNAs based SESAM by explaining that it has high contrast in nonlinear reflectivity variation

To benefit from the high nonlinear reflectivity of GaInNAs SESAM therefore it would have been obvious to modify the disclosure of Paschotta to have the first QW comprise GaInNAs.

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8. Claim 9 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of "Passively Mode-Locked Laser Diodes with Bandgap-Wavelength Detuned Saturable Absorbers," by Kunimatsu et al., IEEE Photonics Technology Letters, Vol. 11, No. 11 (1999), [hereinafter "Kunimatsu"].

The recitation " ... to adjust the saturation fluence of the absorber" is an intended use of the electrodes coupled to the SESAM; it does not further narrow the claim.

Paschotta does not explicitly disclose plurality of electrical contacts coupled to the SESAM.

Kunimatsu however discloses that the electrical bias plays an important role in ultrashort pulse generation. (See, for example, the last sentence of the third paragraph starting in the left column; see, also FIG. 3).

To control the width of generated short optical pulses therefore it would have been obvious to modify the disclosure of Paschotta by controlling the electrical bias on the SESAM (which inherently would require electrodes being coupled to the SESAM).

9. Claims 11, 17, 20, 21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of U.S. PG PUB 2002/0039376 to Kim et al. [hereinafter "Kim"].

Paschotta does not disclose the monolithic gain structure comprising the output coupler.

Kim however discloses a VCSEL having a monolithic gain structure comprising a micro-lens (output coupler). See, for example, the front page.

To focus light emitted from a VCSEL using a simple alignment structure having increased freedom in arranging elements and leading to sharply reduced number of required parts therefore it would have been obvious to modify the disclosure of Paschotta by having the monolithic gain structure comprise a micro-lens output coupler.

With respect to claim 17, Kim discloses (FIG. 2, and the corresponding text in the details description) the micro-lens 190 being on a spacer (175-170-171-160), part of which adjusts the position of the micro-lens with respect to the laser cavity.

With respect to claim 20, Paschotta discloses (FIG. 10) the absorber being aligned with a peak field intensity of a standing wave pattern.

With respect to claim 21, Kim discloses (FIG. 2, and the corresponding text in the detailed description) an electrode 151 coupled to the spacer and the electrode 155 coupled to the lower mirror, the electrodes used in electrically pumping the VCSEL.

10. Claim 12 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of U.S. PG PUB 2002/0110159 to Gerstenberger et al. [hereinafter "Gerstenberger"].

Paschotta does not disclose the apparatus further comprising a non-linear crystal optically coupled to change the wavelength of the laser output.

Gerstenberger however discloses an apparatus comprising a surface emitting semiconductor laser comprising a non-linear crystal 140 to convert the frequency of the laser. See, for example, the front page.

To convert the frequency of the laser therefore it would have been obvious to modify the disclosure of Paschotta by having the apparatus comprise a non-linear crystal.

11. Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of U.S. Pat. No. 5,627,853 to Mooradian et al. [hereinafter "Mooradian"].

Paschotta does not disclose the apparatus comprising a thermal lens within the cavity.

Mooradian however discloses stabilizing the transverse spatial mode of a surface emitting semiconductor laser by having a pump beam cause a thermal lensing effect within the semiconductor material. See, for example the front page figure and the Abstract.

To stabilize the transverse spatial mode of the VCSEL therefore it would have been obvious to modify the disclosure of Paschotta by having the apparatus comprise a thermal lens.

12. Claim 14 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta.

Embodiment shown in FIGs. 8 and 9 of Paschotta do not disclose the apparatus comprising a heat sink thermally coupled to the lower mirror. FIGs. 1 and 7 however show a heat sink 29 thermally coupled to the lower mirror.

To cool the apparatus therefore it would have been obvious to modify the disclosure of Paschotta to provide for a heat sink thermally coupled to the lower mirror.

13. Claims 15 and 16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of U.S. Pat. No. 5,062,115 to Thornton [hereinafter "Thornton"].

Paschotta does not disclose forming an array of the disclosed VCSELS wherein a second output coupler, positioned proximate the lower mirror, forms a second laser cavity, which includes the absorber and the gain region.

Thornton discloses high density, independently addressable surface emitting semiconductor laser arrays, which share the substrate and the gain region. See, for example, the front page. Thornton also motivates forming and using VCSEL arrays. See, for example, the Background of the Invention in column 1.

To generate more emitted power at lower exciting power one would have been motivated to make and use a VCSEL array sharing the substrate and the gain region, and therefore it would have been obvious to modify the disclosure of FIG. 8 in Paschotta to make the VCSEL into an array of independently addressable VCSELS sharing the substrate and the gain region, which inherently results in sharing the absorber disclosed in FIG. 8 of Paschotta.

14. Claim 19 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of Kim, further in view of Gomes and Okhotnikov.

The combination of Paschotta and Kim discloses (see, for example, rejection of claims 11, 17, 20, and 21, explained above in paragraph 9 of this Office Action) all of the features in claim 19 except for the absorber comprising at least one QW layer of GaInNAs.

Gomes however discloses using SESAMs that comprise a GaInNAs QW layer (See, for example, p.130, left column, starting with the fifth sentence in the second full paragraph, referring to the SESAM being grown similar to the SESAM described by Okhotnikov). Gomes also motivates using GaInNAs based SESAM by explaining that it has high contrast in nonlinear reflectivity variation.

To benefit from the high nonlinear reflectivity of GaInNAs SESAM therefore it would have been obvious to modify the combined disclosure of Paschotta and Kim by having the VCSEL comprise an absorber with a QW layer of GaInNAs.

15. Claims 22 and 24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of Thornton, further in view of U.S. PGPUB 2003/0113078 to Tatum et al. [hereinafter "Tatum"].

The combination of Paschotta and Thornton discloses (see, for example, rejection of claims 15 and 16, explained above in paragraph 13 of this Office Action) all of the features of claims 22 and 24 except for a fiber, optically coupling to the VCSEL array and receiving mode-locked laser outputs from the array.

Tatum however discloses a packaging scheme providing a high bandwidth communication system using plastic optical fiber to integrate a light source, such as more than one VCSEL. The advantage of the fiber is in being flexible, light, and possessing a very high bandwidth. See, for example, paragraph [0018] starting on the left column of page 2.

To communicate data through light, flexible, and wide band means therefore it would have been obvious to modify the combined disclosure of Paschotta and Thornton by having a fiber couple to at least the first and second VCSELs and receive their outputs.

16. Claim 23 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of Thornton, further in view of Tatum. Further in view of Kim.

The combination of Paschotta, Thornton, and Tatum discloses (see, for example, rejection of claims 22 and 24, explained above in paragraph 15 of this Office Action) all of the features of claim 23 except for the first and second output couplers being monolithically structured with the gain region, absorber, and the lower mirror.

Kim however discloses a VCSEL having a monolithic gain structure comprising a micro-lens (output coupler). See, for example, the front page.

To focus light emitted from a VCSEL using a simple alignment structure having increased freedom in arranging elements and leading to sharply reduced number of required parts therefore it would have been obvious to modify the combined disclosure of Paschotta, Thornton, and Tatum by having the monolithic gain structure comprise a micro-lens output coupler.

17. Claims 25 and 27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of U.S. Pat. No. 6,628,695 to Aldaz et al. [hereinafter "Aldaz"].

Paschotta discloses (see, for example, rejection of claims 1, 2, 4, 7, and 10, explained above in paragraph 5 of this Office Action) all of the features of claims 25 and 27 except for disclosing a chipset and a clock.

Aldaz however discloses that the low jitter of the pulses from VCSELs enables their use in timing applications, such as providing clock signals for integrated circuits. See, for example, column 11, lines 44-47.

To benefit from the low-jitter of the mode-locked VCSEL disclosed by Paschotta therefore it would have been obvious to use the VCSEL disclosed by Paschotta in providing clock signals to integrated circuits, which inherently include chipsets.

18. Claim 26 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Paschotta in view of Aldaz, further in view of Kim.

The combination of Paschotta and Aldaz discloses (see, for example, rejection of claims 25 and 27, explained above in paragraph 17 of this Office Action) all of the features of claim 26 except for the monolithic gain structure comprising the output coupler.

Kim however discloses a VCSEL having a monolithic gain structure comprising a micro-lens (output coupler). See, for example, the front page.

To focus light emitted from a VCSEL using a simple alignment structure having increased freedom in arranging elements and leading to sharply reduced number of required parts therefore it would have been obvious to modify the combined disclosure of

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Paschotta and Aldaz by having the monolithic gain structure comprise a micro-lens output coupler.

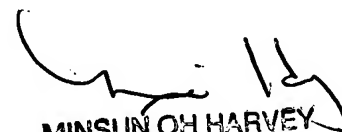
CLOSURE

19. Any inquiry concerning this or any earlier communication should be directed to examiner Hrayr A. Sayadian, who may normally be reached Monday through Friday, 7:30 am-4:00 pm, on (571) 272-7779.

If attempts to reach the examiner by telephone are unsuccessful, his supervisor, Minsun O. Harvey, may be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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